

# Quantification Of Trochlea Dysplasia Via Computed Tomography: Assessment Of Morphology Difference Between Control And Chronic Patellofemoral Instability Patients

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**Objectives:** Trochlear dysplasia is an important risk factor for the development of recurrent patella instability. Owing to its complex 3-Dimensional morphology, the need for a true lateral radiograph, and poor inter-observer reliability, the Dejour classification system of dysplasia may not be the most optimal measure for quantification. The purpose of this study is to report a novel technique to define and quantify the trochlea volume and length using an axial computed tomography. This technique was applied to a series of patients surgically treated for recurrent patellofemoral instability and the measurements compared to a control group.

**Methods:** From 2007 to 2013, 99 control patients (136 knees) were identified from trauma CT scans obtained during admission at our Level I trauma hospital. Patients older than 35y/o or with fractures in the distal femur were excluded. Axial cuts at 1.25mm were used to measure trochlea volume; defined to be from the physeal scar to the final axial image in which the sulcus could be visualized (Figure 1). Trochlear groove distance was measured from a midline sagittal reformatted image perpendicular to the posterior margin of the femoral condyles. The inter-observer reliability was assessed with independent measurements from attending orthopedist, MSK radiologist and two senior residents. Dysplasia patient cohort was a series of 35 patients (70knees) who were surgically treated for recurrent instability, by AAS or CME, from 2007-2013 and a diagnosis of dysplasia based on lateral knee radiograph. CT tracking studies are obtained from bilateral knees as a normal part of our pre-operative assessment. Institutional IRB approval was obtained for data retrieval.

**Results:** Control cohort average age 25 +/- 4 years, 68M:31F, without documented history of patella instability on chart review. Dysplastic cohort average age 24 +/- 5 years, 2M:33F, all 35 patients had bilateral knees scanned. Statistically significant differences were noted in comparing the trochlea volume (3.75 +/- 0.97 cm<sup>3</sup> vs. 2.0 +/- 0.56 cm<sup>3</sup>) and the trochlea length (34.8 +/- 4.9 mm vs. 31.7 +/- 4.2 mm) between control and dysplastic cohorts respectively. Comparing female only patients demonstrated difference in trochlea volume (2.89 +/- 0.57 cm<sup>3</sup> vs. 2.0 +/- 0.36 cm<sup>3</sup>), but not trochlea length (31.7 +/- 2.5 mm vs. 31.7 +/- 2.7 mm). No difference in trochlea volume or length b/w symptomatic knee to asymptomatic contralateral knees in patients with recurrent instability (2.31 cm<sup>3</sup> vs. 2.24 cm<sup>3</sup>) and (30.0 mm vs. 30.5 mm). Inter-observer reliability was assess measuring trochlea volume: ICC for Right Trochlea: 0.98, ICC Left Trochlea: 0.97.

**Conclusion:** This novel technique clearly defines and quantifies the trochlea morphology into volume and length values with high ICC values. Applying this technique demonstrates a significant difference in both trochlea volume and length between a control group and patients treated for recurrent patellofemoral instability.

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Figure 1.

Example of CT quantification method comparing a control patient A-C and dysplastic patient D-F, volumaized trochlea represented in C (control) and F (dysplastic).

